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QUARTERLY ENVIRONMENTAL DATA SUMMARY - THIRD QUARTER 1992

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

DECEMBER 1992 **REV. 0**

U.S. Department of Energy
Oak Ridge Field Office
Weldon Spring Site Remedial Action Project

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Weldon Spring Site Remedial Action Project

Quarterly Environmental Data Summary - Third Quarter 1992

Revision 0

December 1992

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ABSTRACT

The purpose of this *Quarterly Environmental Data Summary* is to provide to the public preliminary data acquired as part of the Weldon Spring Site Remedial Action Project (WSSRAP) environmental monitoring program. The document summarizes the preliminary environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1992 annual site environmental report.

This report includes preliminary data from environmental monitoring activities at the Weldon Spring site (WSS) during the third quarter of 1992. Groundwater, surface water, and air samples were collected in order to monitor potential exposure pathways. Analytical parameters included radionuclides, nitroaromatic compounds, inorganic anions, and direct gamma exposure. The results are used to evaluate possible exposure scenarios and assess the impact of the contaminants at the site on potentially exposed populations.

In summary, off-site exposures during the third quarter of 1992 did not differ significantly from exposures calculated in previous quarters. Contaminated groundwater did not affect the St. Charles County well field.

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1 INTRODUCTION

This quarterly report summarizes the findings from the routine environmental monitoring programs at the Weldon Spring Site Remedial Action Project (WSSRAP). These quarterly reports supplement the annual site environmental report (ASER) by providing interested outside agencies and organizations with more frequent access to WSSRAP data. They provide data resulting from routine environmental sampling as described in the WSSRAP *Environmental Monitoring Plan* (EMP) (MKF and JEG 1992a) and a brief interpretation of that data.

It is the goal of this document to summarize and briefly discuss the data, highlighting data that differ significantly from historical observations. The full interpretation of these data (as well as data in other quarterly summaries) will be undertaken in the 1992 ASER. It is recommended that interested readers refer to previous EMPs, ASERs, and project documents for more information on existing site conditions, site history, transport mechanisms, and quantified contaminant levels. The monitoring scheme for every calendar year is established prior to that year in the annual EMP. Each sampling location to be monitored during the upcoming year is identified in the EMP and the schedule of analytical parameters is tabulated for easy reference. These reports may be obtained by visiting the WSSRAP reading room or contacting the WSSRAP Community Relations Manager at (314) 441-8086.

These quarterly reports are intended to include data from all quarterly environmental monitoring programs conducted at the WSSRAP including groundwater, springs, surface water, National Pollutant Discharge Elimination System (NPDES), radon gas, gamma radiation, and air particulates (including asbestos and radioactive particulates). This document summarizes the preliminary environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1992 annual site environmental report. Because standard turnaround time to receive data from the laboratories is 45 days, not all third quarter data are available for reporting. These data will be reported in the 1992 ASER. Sludges and soils are not sampled on a routine basis; therefore, analytical results for these parameters are not included in this report. Trend analyses are being prepared from historical data for surface water, groundwater, and air pathways. These analyses will be presented in the 1992 ASER. Quality control (QC) data for the third quarter and fourth bimonthly periods, along with all other periods, will be presented in the 1992 ASER.

2 GROUNDWATER MONITORING

The groundwater is sampled regularly at both the Weldon Spring Chemical Plant/raffinate pits/vicinity properties (WSCP/RP/VP) and the Weldon Spring Quarry (WSQ). Due to differences in the environmental settings and sources of contaminants, separate monitoring schedules are followed. Therefore, results of groundwater monitoring at the WSCP/RP/VP and WSQ will be discussed separately.

2.1 Chemical Plant/Raffinate Pits/Vicinity Properties

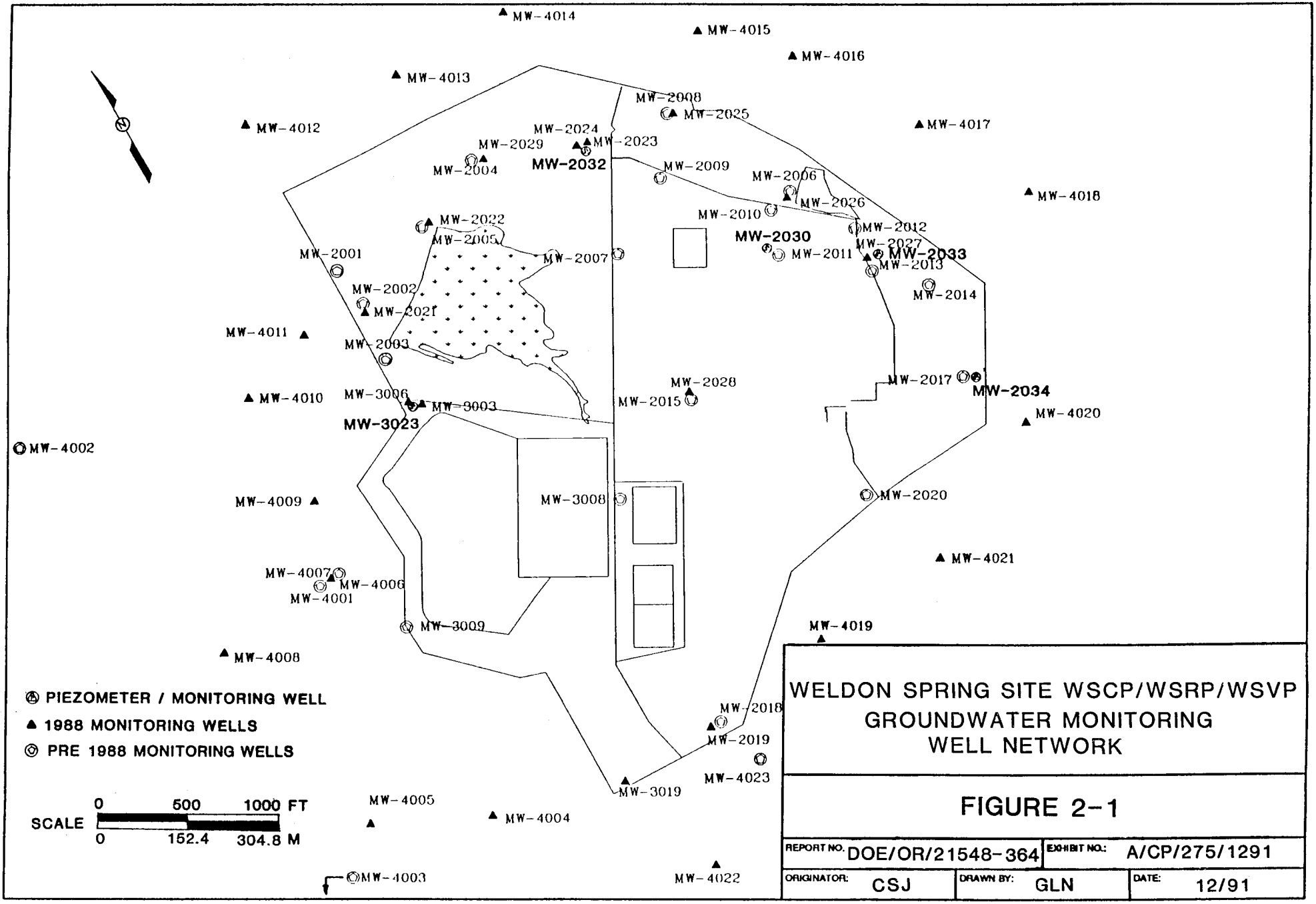
Groundwater at the chemical plant/raffinate pits/vicinity properties area is monitored on a quarterly or semiannual basis (specific to each well as prescribed in the 1992 *Environmental Monitoring Plan* (MKF and JEG 1992a). Locations are given in Figure 2-1. The number of quarterly sampled wells has increased substantially; a complete list of wells scheduled for quarterly and semiannual sampling is given in the 1992 EMP. Total uranium, inorganic anions, and nitroaromatic compounds are measured during each monitoring period for both quarterly and semiannual wells. Other radiological parameters are measured annually during the first period for all wells.

2.1.1 Nitroaromatic Results

Table 2-1 contains nitroaromatic data from samples collected from the quarterly monitored groundwater wells. Nitroaromatic compounds were detected in 16 of the 32 locations for which data are currently available. Concentration levels for these compounds are within their historical range, with the following exceptions: new 2,4,6-trinitrotoluene (TNT) highs were recorded in wells MW-2030, MW-2032, MW-2033, a new 2,4-dinitrotoluene (DNT) high was recorded in MW-3023, and new 1,3,5-trinitrobenzene (TNB) highs were recorded in MW-2030, MW-2033, and MW-4001. A new 1,3,5-TNB low was measured in MW-4013.

2.1.2 Radiological Results

The upper bound for natural uranium background concentration in groundwater at the WSCP/RP/VP has been determined to be 3.4 pCi/l (0.13 Bq/l) (MKF and JEG 1989). The



WELDON SPRING SITE WSCP/WSRP/WSVP GROUNDWATER MONITORING WELL NETWORK

FIGURE 2-1

REPORT NO.	DOE/OR/21548-364	EXHIBIT NO.:	A/CP/275/1291		
ORIGINATOR:	CSJ	DRAWN BY:	GLN	DATE:	12/91

TABLE 2-1 Third Quarter Nitroaromatic Results for Groundwater at the WSCP/RP/VP

Sample ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-2001-Q392	ND	ND	0.087	0.060	ND	0.035
GW-2002-Q392	ND	ND	0.063	0.39	ND	ND
GW-2003-Q392	ND	ND	0.15	0.80	ND	ND
GW-2030-Q392	ND	ND	0.14	10.0	14.0	9.5
GW-2032-Q392	ND	ND	0.15	4.0	9.0	3.2
GW-2033-Q392	ND	ND	0.34	8.0	3.2	12.0
GW-3003-Q392	ND	ND	0.061	0.13	ND	ND
GW-3006-Q392	ND	ND	ND	ND	ND	ND
GW-3008-Q392	NA	NA	NA	NA	NA	NA
GW-3009-Q392	ND	ND	0.20	0.057	ND	0.14
GW-3023-Q392	ND	ND	8.5	8.4	ND	ND
GW-4001-Q392	ND	0.11	3.2	5.8	1.7	72
GW-4002-Q392	ND	ND	ND	0.19	0.22	0.32
GW-4003-Q392	ND	ND	ND	ND	ND	ND
GW-4004-Q392	ND	ND	ND	ND	ND	ND
GW-4005-Q392	ND	ND	ND	ND	ND	ND
GW-4006-Q392	0.037	ND	0.091	4.4	ND	10.0
GW-4007-Q392	ND	ND	ND	ND	ND	ND
GW-4008-Q392	ND	ND	ND	ND	ND	ND
GW-4009-Q392	ND	ND	ND	ND	ND	ND
GW-4010-Q392	ND	ND	ND	ND	ND	ND
GW-4011-Q392	ND	ND	ND	ND	ND	ND
GW-4012-Q392	ND	ND	ND	ND	ND	ND
GW-4013-Q392	ND	ND	0.056	0.84	0.040	32
GW-4014-Q392	ND	ND	ND	0.052	0.031	0.40
GW-4015-Q392	ND	ND	0.048	0.59	ND	0.34
GW-4016-Q392	ND	ND	ND	ND	ND	ND
GW-4017-Q392	ND	ND	ND	ND	ND	ND
GW-4018-Q392	ND	ND	ND	ND	ND	ND

TABLE 2-1 Third Quarter Nitroaromatic Results for Groundwater at the WSCP/RP/VP (Continued)

Sample ID	NB (μg/l)	1,3-DNB (μg/l)	2,4-DNT (μg/l)	2,6-DNT (μg/l)	2,4,6-TNT (μg/l)	1,3,5-TNB (μg/l)
GW-4019-Q392	ND	ND	ND	ND	ND	ND
GW-4020-Q392	ND	ND	ND	ND	ND	ND
GW-4021-Q392	ND	ND	ND	ND	ND	ND
GW-4022-Q392	ND	ND	ND	ND	ND	ND
GW-4023-Q392	ND	ND	0.076	0.039	ND	0.14

NA - Not Available
ND - Not Detected

U.S. Environmental Protection Agency (EPA) has not yet established a drinking water standard for uranium; however, the proposed maximum contaminant level (MCL) is 20 μg/l, which converts to 13.6 pCi/l (0.50 Bq/l) using a new site-specific conversion factor of 0.68 pCi/μg (assuming isotopic equilibrum). The increase to 13.6 pCi/l (0.50 Bq/l) from the previously reported value of 12 pCi/l (0.44 Bq/l) reflects improved quantification of the average U-234/U-238 activity ratios for uranium present at the Weldon Spring Site Remedial Action Project (WSSRAP). The U.S. Department of Energy (DOE) has a health-based, derived concentration guideline (DCG) of 600 pCi/l (22.2 Bq/l) in surface water effluent.

Total uranium results for samples from the quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-2. Uranium concentrations remained within historical ranges at all locations for which data are presently available.

2.1.3 Sulfate and Nitrate Results

Sulfate and nitrate concentrations are measured during each monitoring period. Results from the quarterly monitored wells are shown in Table 2-2. Third quarter results are within historical ranges with the exception of a new nitrate high in MW-3023 and a nitrate low in MW-3009. A new sulfate high was recorded in MW-2033 and a new low in MW-2003. These extreme values are thought to reflect natural fluctuation in these wells.

TABLE 2-2 Third Quarter Uranium and Inorganic Anion Results for Groundwater at the WSCP/RP/VP

Sample ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-2001-Q392	30.6	8.70	ND
GW-2002-Q392	264	118	ND
GW-2003-Q392	229	92.7	ND
GW-2030-Q392	1.40	39.5	9.80
GW-2032-Q392	55.0	55.0	ND
GW-2033-Q392	0.74	28.4	NA
GW-3003-Q392	338	152	18
GW-3006-Q392	0.07	22.7	ND
GW-3008-Q392	NA	NA	NA
GW-3009-Q392	60.8	84.9	NA
GW-3023-Q392	495	305	8.30
GW-4001-Q392	32.6	65.6	ND
GW-4002-Q392	6.00	15.3	ND
GW-4003-Q392	0.91	34.0	ND
GW-4004-Q392	0.94	19.9	2.0
GW-4005-Q392	2.00	20.6	ND
GW-4006-Q392	4.40	28.4	ND
GW-4007-Q392	0.25	12.8	2.5
GW-4008-Q392	0.03	14.0	ND
GW-4009-Q392	0.17	16.2	5.4
GW-4010-Q392	0.16	22.3	3.7
GW-4011-Q392	28.9	54.8	6.4
GW-4012-Q392	0.06	46.7	0.82
GW-4013-Q392	49.7	39.7	ND
GW-4014-Q392	0.02	26.8	ND
GW-4015-Q392	1.40	7.10	ND
GW-4016-Q392	ND	17.6	3.7
GW-4017-Q392	0.45	5.60	ND

TABLE 2-2 Third Quarter Uranium and Inorganic Anion Results for Groundwater at the WSCP/RP/VP (Continued)

Sample ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-4018-Q392	2.40	6.50	ND
GW-4019-Q392	0.41	6.30	1.7
GW-4020-Q392	2.80	129	12.0
GW-4021-Q392	0.12	264	6.9
GW-4022-Q392	0.38	37.8	4.8
GW-4023-Q392	4.00	68.2	ND

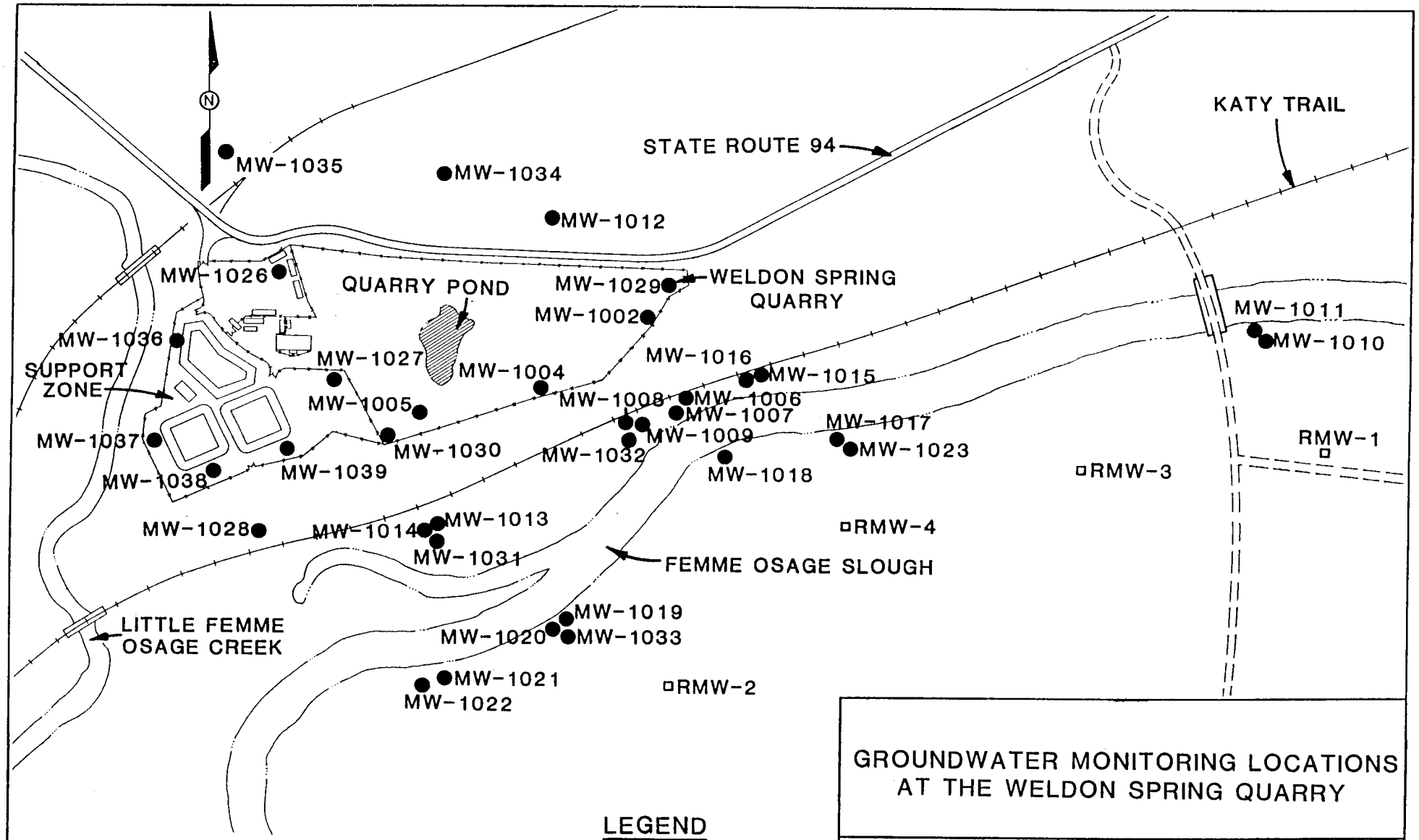
ND - Not Detected
NA - Not Available

2.2 Weldon Spring Quarry

Groundwater at the WSQ has become radiologically and chemically contaminated as a result of contact with, or migration from, wastes present in the WSQ. Monitoring of the groundwater at and near the WSQ is of particular concern because of the proximity of the St. Charles County well field. The well field is located approximately 0.8 km (0.5 mi) to the south of the WSQ. Monitoring of contaminants in groundwater and the protection of the well field is a top priority at the WSSRAP.

Groundwater is currently being monitored at 48 wells located in and around the quarry area. Thirty-six monitoring wells installed by the DOE are currently utilized in or near the quarry. Four monitoring wells were installed by St. Charles County in 1986 and are currently included in the DOE's monitoring program. Eight St. Charles County municipal wells, and the treated and untreated water from the St. Charles County water treatment plant, are also monitored for the presence of these contaminants. All monitoring well locations are shown in Figures 2-2 and 2-3. These wells monitor groundwater in both the bedrock and alluvial aquifers associated with the WSQ.

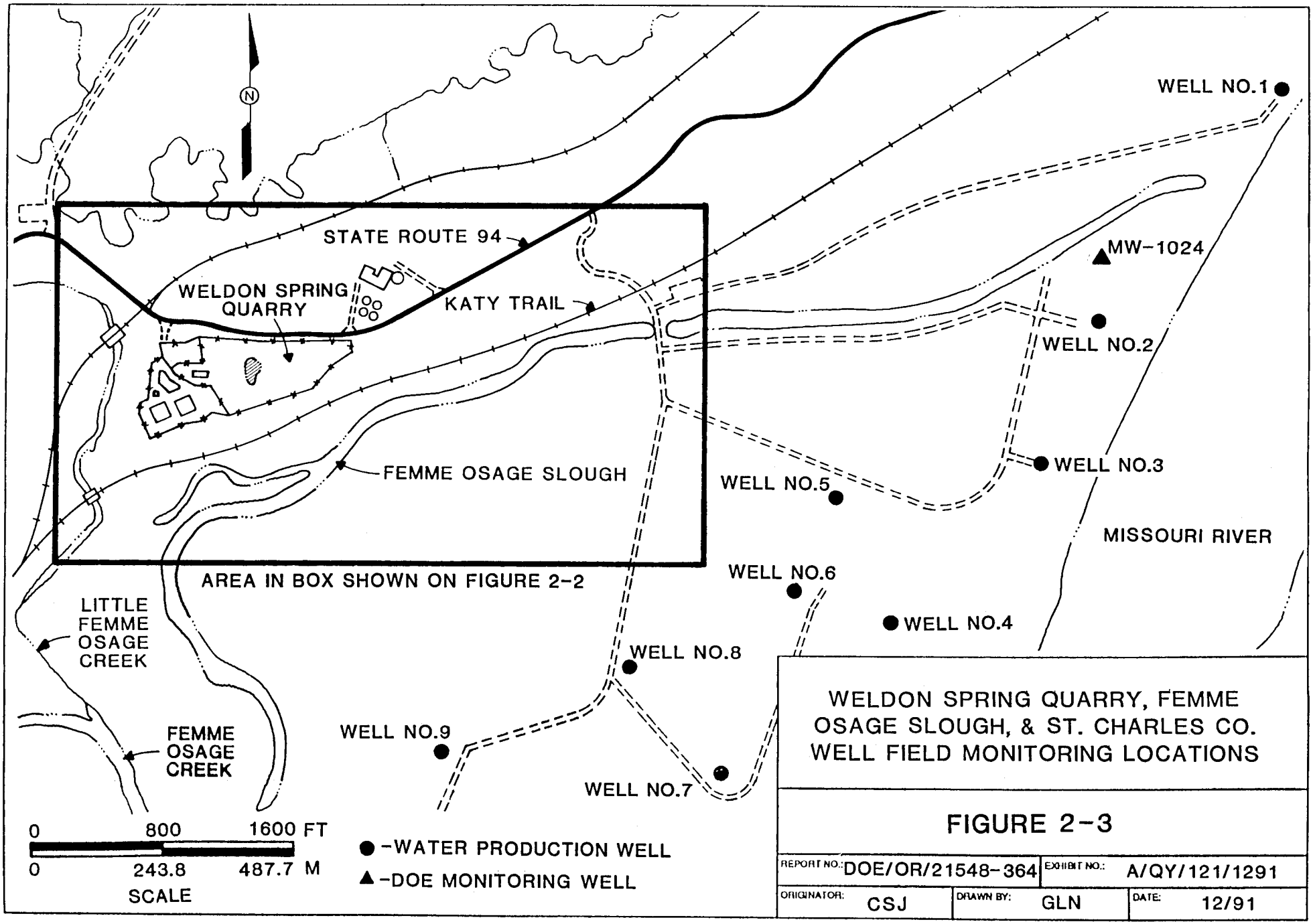
Two separate groundwater monitoring programs have been developed for the WSQ area. The first program is a bimonthly sampling of all wells north of the Femme Osage Slough and MW-1010 and MW-1011 located south of the slough. In addition, wells MW-1035, MW-1036,



GROUNDWATER MONITORING LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 2-2

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/QY/120/1291		
ORIGINATOR:	CSJ	DRAWN BY:	GLN	DATE:	12/91



WELDON SPRING QUARRY, FEMME OSAGE SLOUGH, & ST. CHARLES CO. WELL FIELD MONITORING LOCATIONS

FIGURE 2-3

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/QY/121/1291		
ORIGINATOR:	CSJ	DRAWN BY:	GLN	DATE:	12/91

MW-1037, MW-1038, and MW-1039 will be sampled bimonthly until operation of the Weldon Spring Quarry water treatment plant is initiated. The second program is the quarterly sampling of all wells south of the Femme Osage Slough, excluding MW-1010 and MW-1011, but including the St. Charles County well field. Both the raw and treated waters from the St. Charles County water treatment plant are also sampled quarterly.

2.2.1 Radiological Results

Radiological data are presented in Tables 2-3 and 2-4 for samples collected for the fourth bimonthly period and the third quarter. The results show typical fluctuations near the average levels in the WSQ area. Last quarter the uranium concentration in MW-1032 exceeded the historic average; results for this quarter are slightly below the results for the second quarter. Continued monitoring will be performed to determine whether this is a trend. Detectable concentrations of uranium were indicated from the St. Charles County RMW-series wells. In addition to being within historic averages and representative of background levels, these levels are the results of lower detection limits for uranium during analytical testing. The results for the St. Charles County production wells (PWOX series) were not available from the laboratory at the time of this report.

The St. Charles County RMW-series and production wells are sampled annually for gross alpha. The results of this analysis are presented in Table 2-4. The results for the St. Charles County production wells were not made available at the time of this report. The concentrations in the RMW-series wells are consistent with background values of waters in or near the WSQ.

2.2.2 Nitroaromatic Compounds Results

Analytical results for the fourth bimonthly period and the third quarter for nitroaromatic compounds are presented in Tables 2-5 and 2-6. No monitoring wells south of the Femme Osage Slough showed detectable concentrations of nitroaromatic compounds during the third quarter of 1992. The elevated levels of nitroaromatic compounds detected in rim well MW-1004 remain consistent with the second and third bimonthly results. Nitroaromatic levels have increased in bedrock monitoring well MW-1027. The distribution and magnitude of nitroaromatic contamination in the remainder of the wells near the quarry remain consistent with historical levels.

TABLE 2-3 Fourth Bimonthly (July/August) Uranium and Inorganic Anion Results for Groundwater at the WSQ

Sample ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-1002-B492	0.34	54.2	ND
GW-1004-B492	0.56	372	6100
GW-1005-B492	ND	170	2200
GW-1006-B492	0.14	426	4100
GW-1007-B492	ND	61.6	59
GW-1008-B492	ND	279	4800
GW-1009-B492	ND	275	10
GW-1010-B492	0.38	ND	ND
GW-1011-B492	WELL DRY		
GW-1012-B492	0.99	65.9	2.4
GW-1013-B492	ND	97.9	920
GW-1014-B492	ND	108	1100
GW-1015-B492	1.80	352	1500
GW-1016-B492	1.30	271	690
GW-1026-B492	ND	0.92	ND
GW-1027-B492	0.12	100	900
GW-1028-B492	ND	71.4	ND
GW-1029-B492	ND	76.9	ND
GW-1030-B492	ND	105	3.3
GW-1031-B492	ND	35.8	26
GW-1032-B492	ND	254	1600
GW-1034-B492	0.41	71.5	0.58
GW-1035-B492	0.20	35.3	ND
GW-1036-B492	ND	58.4	4.6
GW-1037-B492	ND	15.1	ND
GW-1038-B492	ND	45.1	2.4
GW-1039-B492	ND	54.6	0.72

ND - Not Detected
NA - Not Available

TABLE 2-4 Third Quarter Uranium and Inorganic Anion Results for Groundwater at the WSQ

Sample ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)	Gross Alpha (pCi/l)
GW-1017-Q392	ND	ND	0.2	NR
GW-1018-Q392	ND	100.0	0.61	NR
GW-1019-Q392	ND	0.85	NA	NR
GW-1020-Q392	0.17	41.9	NA	NR
GW-1021-Q392	ND	1.80	NA	NR
GW-1022-Q392	0.12	0.33	NA	NR
GW-1023-Q392	ND	4.00	0.2	NR
GW-1024-Q392	ND	3.10	ND	3.0
GW-1033-Q392	ND	10.0	NA	NA
GW-RMW1-Q392	ND	27.2	0.82	7.7
GW-RMW2-Q392	ND	12.3	NA	NA
GW-RMW3-Q392	ND	5.10	0.2	7.4
GW-RMW4-Q392	ND	23.4	1.4	3.9
GW-PW02-Q392	NR	NR	NA	NA
GW-PW03-Q392	NR	NR	NA	NA
GW-PW04-Q392	NR	NR	NA	NA
GW-PW05-Q392	NR	NR	NA	NA
GW-PW06-Q392	NR	NR	NA	NA
GW-PW07-Q392	NR	NR	NA	NA
GW-PW08-Q392	NR	NR	NA	NA
GW-PW09-Q392	NR	NR	NA	NA
GW-RAWW-Q392	NR	NR	NA	NA
GW-FINW-Q392	NR	NR	NA	NA

ND - Not Detected
NA - Not Available
NR - Not Required for third quarter

TABLE 2-5 Fourth Bimonthly (July/August) Nitroaromatic Results for Groundwater at the WSQ

Sample ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-1002-B492	ND	0.21	0.078	11	46	280
GW-1004-B492	ND	ND	4.2	5.7	22	7.0
GW-1005-B492	ND	ND	0.098	0.034	ND	ND
GW-1006-B492	ND	ND	0.40	6.0	24	140
GW-1007-B492	ND	ND	ND	ND	ND	ND
GW-1008-B492	ND	ND	ND	0.10	ND	ND
GW-1009-B492	ND	ND	ND	ND	ND	ND
GW-1010-B492	ND	ND	ND	ND	ND	ND
GW-1011-B492	WELL DRY					
GW-1012-B492	ND	ND	ND	ND	ND	ND
GW-1013-B492	ND	ND	0.035	0.014	ND	ND
GW-1014-B492	ND	ND	ND	ND	ND	ND
GW-1015-B492	ND	0.093	0.066	0.88	32	230
GW-1016-B492	ND	ND	ND	0.20	5.0	27
GW-1026-B492	ND	ND	ND	ND	ND	ND
GW-1027-B492	ND	ND	7.5	5.3	38	0.086
GW-1028-B492	ND	ND	ND	ND	ND	ND
GW-1029-B492	ND	ND	ND	ND	ND	ND
GW-1030-B492	ND	ND	0.033	ND	ND	ND
GW-1031-B492	ND	ND	ND	ND	ND	ND
GW-1032-B492	ND	ND	0.096	0.084	0.060	ND
GW-1034-B492	ND	ND	ND	ND	ND	ND
GW-1035-B492	ND	ND	ND	ND	ND	ND
GW-1036-B492	ND	ND	ND	ND	ND	ND
GW-1037-B492	ND	ND	ND	ND	ND	ND
GW-1038-B492	ND	ND	ND	ND	ND	ND
GW-1039-B492	ND	ND	ND	ND	ND	ND

NA - Not Available
ND - Not Detected

TABLE 2-6 Third Quarter Nitroaromatic Results for Groundwater at the WSQ

Sample ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-1017-Q392	ND	ND	ND	ND	ND	ND
GW-1018-Q392	ND	ND	ND	ND	ND	ND
GW-1019-Q392	ND	ND	ND	ND	ND	ND
GW-1020-Q392	ND	ND	ND	ND	ND	ND
GW-1021-Q392	ND	ND	ND	ND	ND	ND
GW-1022-Q392	ND	ND	ND	ND	ND	ND
GW-1023-Q392	ND	ND	ND	ND	ND	ND
GW-1024-Q392	ND	ND	ND	ND	ND	ND
GW-1033-Q392	ND	ND	ND	ND	ND	ND
GW-RMW1-Q392	ND	ND	ND	ND	ND	ND
GW-RMW2-Q392	ND	ND	ND	ND	ND	ND
GW-RMW3-Q392	ND	ND	ND	ND	ND	ND
GW-RMW4-Q392	ND	ND	ND	ND	ND	ND
GW-PW02-Q392	ND	ND	ND	ND	ND	ND
GW-PW03-Q392	ND	ND	ND	ND	ND	ND
GW-PW04-Q392	ND	ND	ND	ND	ND	ND
GW-PW05-Q392	ND	ND	ND	ND	ND	ND
GW-PW06-Q392	ND	ND	ND	ND	ND	ND
GW-PW07-Q392	ND	ND	ND	ND	ND	ND
GW-PW08-Q392	ND	ND	ND	ND	ND	ND
GW-PW09-Q392	ND	ND	ND	ND	ND	ND
GW-RAWW-Q392	ND	ND	ND	ND	ND	ND
GW-FINW-Q392	ND	ND	ND	ND	ND	ND

NA - Not Available
ND - Not Detected

2.2.3 Inorganic Anions Results

Two inorganic anions, nitrate and sulfate, are sampled in all of the wells monitored at the WSQ. The analytical results for the fourth bimonthly period and the third quarter are presented in Tables 2-3 and 2-4. An elevated level of sulfate was detected in rim well MW-1005 and alluvial well MW-1010. The results for the remainder of the monitoring wells are consistent with data reported in the previous environmental monitoring reports. The WSQ groundwater samples continue to indicate that there is no significant nitrate contamination of the groundwater. The results indicate that elevated sulfate levels are present in groundwater within the WSQ and north of the Femme Osage Slough.

2.2.4 Metals Results

All wells in the WSQ monitoring program are sampled for arsenic and barium. The results for the fourth bimonthly period and the third quarter are presented in Tables 2-7 and 2-8. Arsenic levels were consistent with historical values for groundwater in the vicinity of the WSQ. Barium levels have remained elevated in the wells in the vicinity of the Femme Osage Slough. Elevated barium levels indicated in the second and third bimonthly periods for rim well MW-1002 have remained unchanged.

2.3 Springs

Five springs near the Weldon Spring site (WSS), which are measurably influenced by site-related contaminants, were sampled during the third quarter (see Figure 2-4). During the third quarter, spring samples were analyzed for uranium and inorganic anions. Results are presented in Table 2-9. SP-6301 and SP-6306 were sampled during high and low flow to evaluate the groundwater (which is thought to predominate low flow) and surface water (which is thought to dominate high flow) components of flow. In comparison to the high flow sample from SP-6301, the low flow sample had higher levels of nitrate and sulfate, but a similar level of uranium. There was little difference between the high and low flow samples from SP-6306.

TABLE 2-7 Fourth Bimonthly (July/August) Metal Results for Groundwater at the WSQ

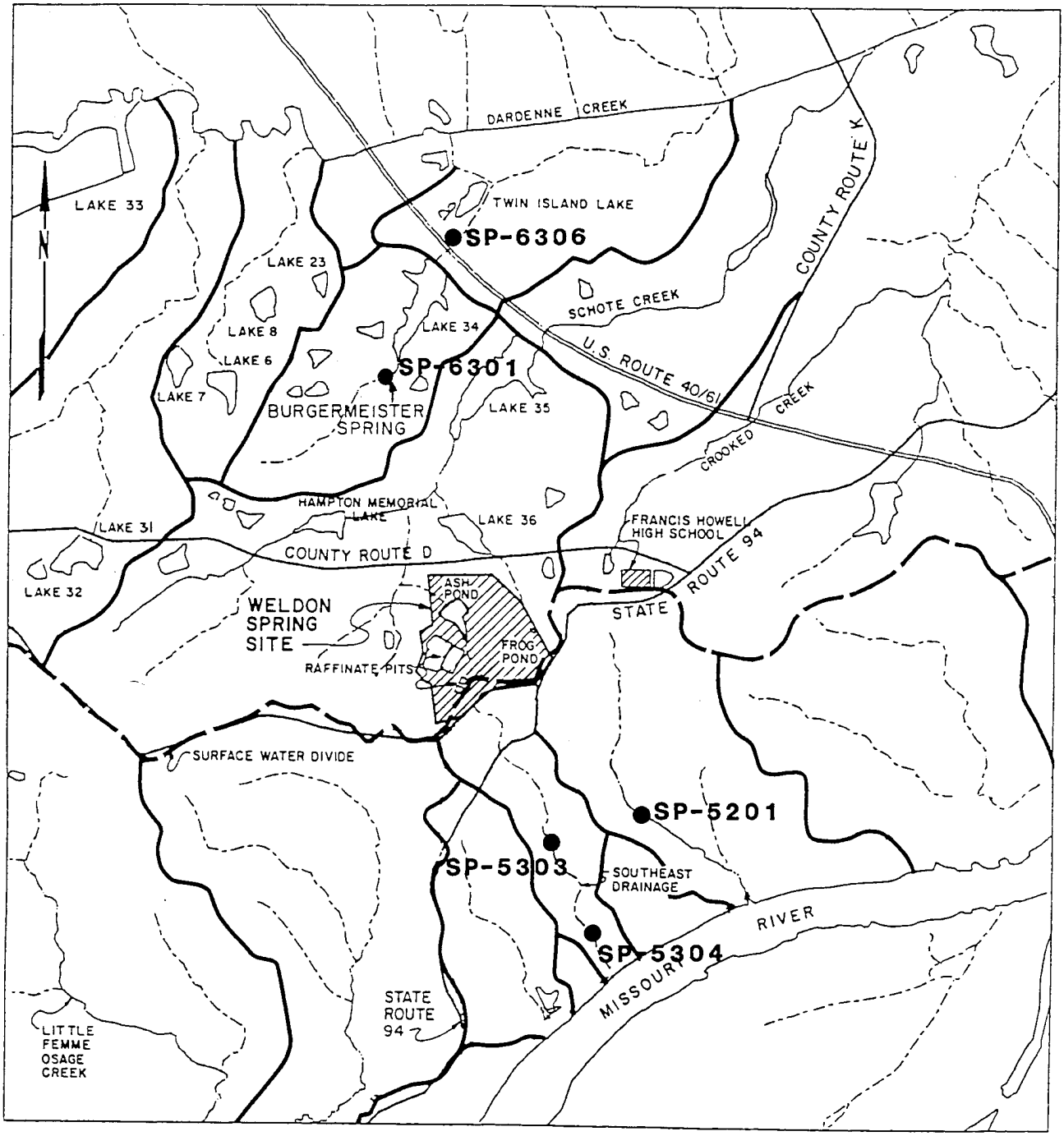
Sample ID	Arsenic (µg/l)	Barium (µg/l)
GW-1002-B492	ND	127
GW-1004-B492	ND	43.3
GW-1005-B492	ND	54.3
GW-1006-B492	ND	56.7
GW-1007-B492	25.2	336
GW-1008-B492	ND	50.2
GW-1009-B492	2.29	482
GW-1010-B492	103	407
GW-1011-B492	WELL DRY	
GW-1012-B492	ND	124
GW-1013-B492	2.70	142
GW-1014-B492	ND	158
GW-1015-B492	ND	109
GW-1016-B492	ND	119
GW-1026-B492	20.6	360
GW-1027-B492	ND	92.6
GW-1028-B492	5.90	303
GW-1029-B492	ND	118
GW-1030-B492	ND	132
GW-1031-B492	ND	94.1
GW-1032-B492	ND	93.3
GW-1034-B492	ND	154
GW-1035-B492	ND	200
GW-1036-B492	ND	264
GW-1037-B492	ND	639
GW-1038-B492	ND	199
GW-1039-B492	ND	425

ND - Not Detected
NA - Not Available

TABLE 2-8 Third Quarter Metal Results for Groundwater at the WSQ

Sample ID	Arsenic (µg/l)	Barium (µg/l)
GW-1017-Q392	144.0	1000
GW-1018-Q392	127.0	719
GW-1019-Q392	69.2	852
GW-1020-Q392	20.5	398
GW-1021-Q392	52.0	803
GW-1022-Q392	138	524
GW-1023-Q392	68.0	323
GW-1024-Q392	7.90	508
GW-1033-Q392	ND	398
GW-RMW1-Q392	4.80	474
GW-RMW2-Q392	14.2	319
GW-RMW3-Q392	26.10	727
GW-RMW4-Q392	26.10	231
GW-PW02-Q392	ND	321
GW-PW03-Q392	ND	249
GW-PW04-Q392	ND	283
GW-PW05-Q392	ND	398
GW-PW06-Q392	ND	328
GW-PW07-Q392	ND	470
GW-PW08-Q392	2.30	464
GW-PW09-Q392	3.20	528
GW-RAWW-Q392	ND	372
GW-FINW-Q392	ND	134

ND - Not Detected
NA - Not Available



● SPRING

0 3200 6400 FT

0 975.4 1950.7 M

SCALE

SPRINGS IN THE VICINITY OF THE WSS

FIGURE 2-4

REPORT NO.: DOE/OR/21548-364		EXHIBIT NO.:	A/VP/040/0592
ORIGINATOR: MGT	DRAWN BY: GLN	DATE:	5/92

TABLE 2-9 Third Quarter Uranium and Inorganic Anion Results for Springs Near the Weldon Spring Site

Sample ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
SP-6301-Q392-H	1.60	52.0	81.0
SP-6301-Q392-L	56.1	66.8	80.0
SP-6306-Q392-H	0.28	6.40	ND
SP-6306-Q392-L	0.32	5.70	0.96
SP-5303-Q392	0.65	62.1	160
SP-5304-Q392	0.76	50.7	140
SP-5201-Q392	0.18	57.8	0.75

ND - Not Detected
NA - Not Available

3 SURFACE WATER MONITORING

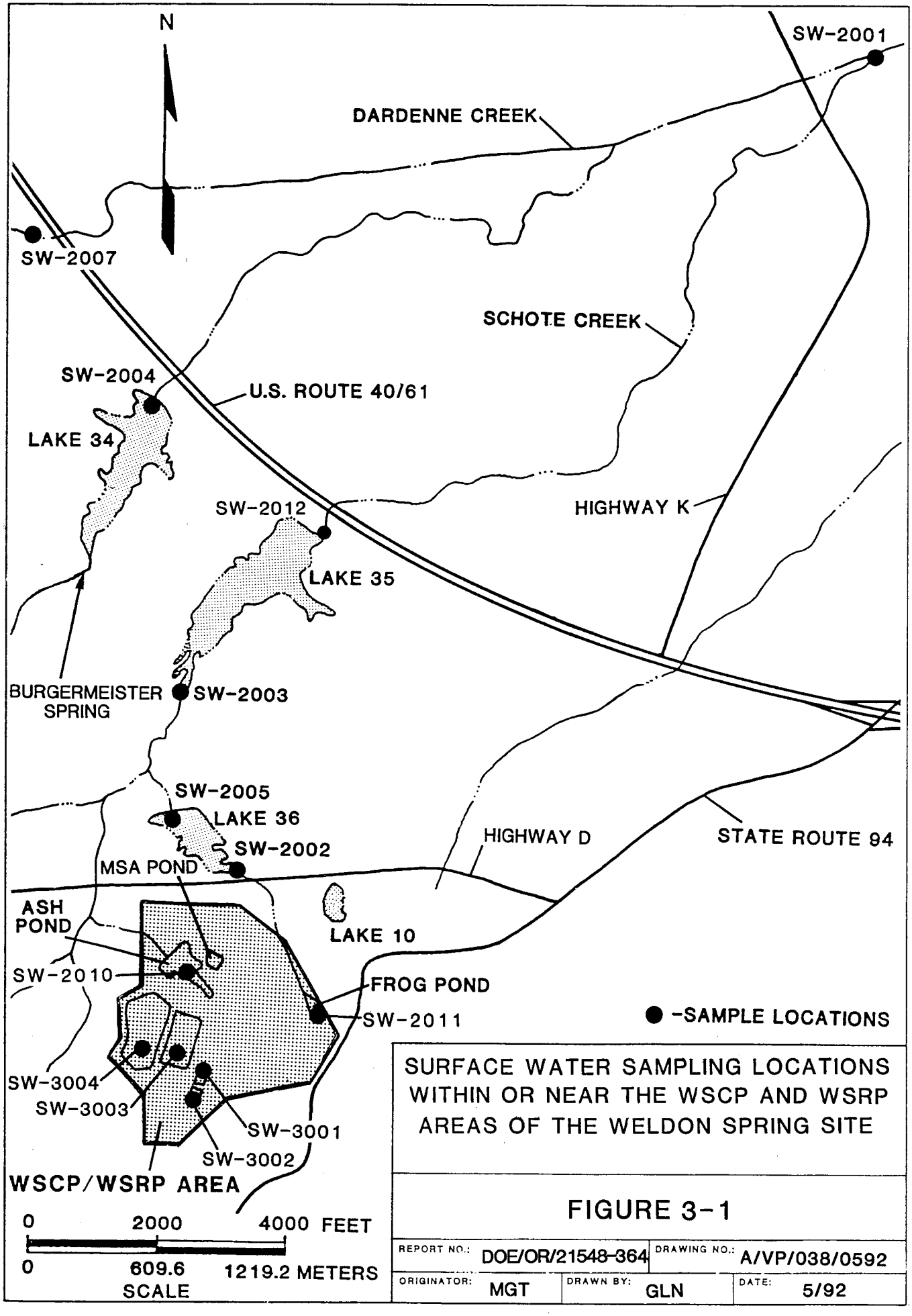
Routine samples were collected during the third quarter of 1992 from both on-site and off-site surface water locations. All surface water samples were analyzed without filtering, unless a specific comparison of dissolved versus total contaminant concentrations was desired. Some analytical results are not available at this time; however, they will be presented in the 1992 annual site environmental report (ASER).

3.1 Chemical Plant/Raffinate Pits/Vicinity Properties

During the third quarter, surface water samples were collected from 11 of the 15 surface water sampling locations shown in Figure 3-1 and analyzed for uranium, radium, thorium, gross alpha, and gross beta. Monitoring point SW-2016, not shown in Figure 3-1, is located at the intersection of Dardenne Creek and County Highway N. This is now the furthest location downstream at which to measure contaminant levels in Dardenne Creek after it has received the Schote Creek contribution. The results, presented in Table 3-1, indicated that conditions at sampling locations remain consistent with historical values.

3.2 Weldon Spring Quarry

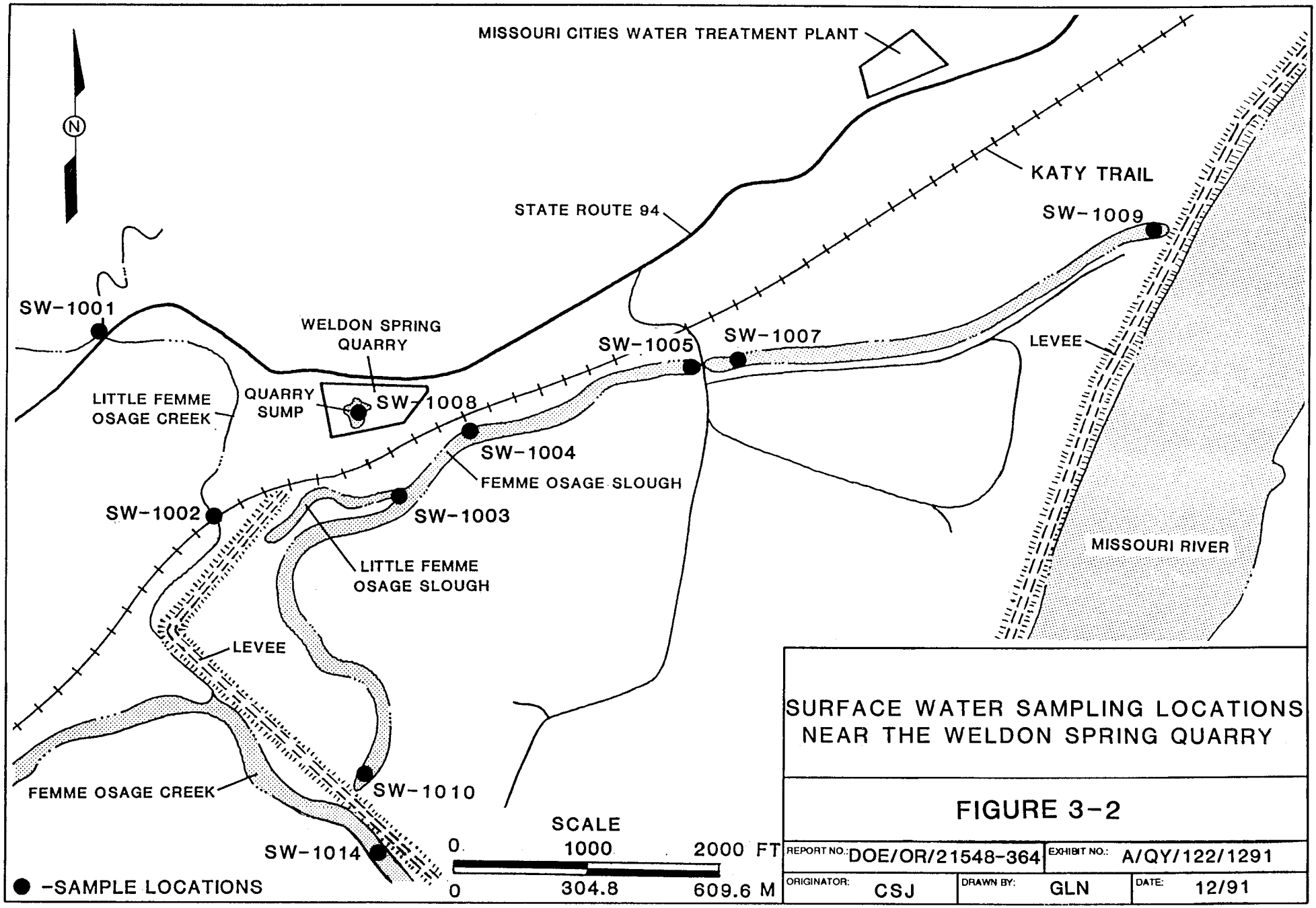
Monitoring locations SW-1001, SW-1002, and SW-1014 (Figure 3-2) monitor the Little Femme Osage Creek at points upstream and downstream of the Weldon Spring Quarry (WSQ). Six sampling locations, SW-1003 through SW-1005, SW1007, SW-1009, and SW-1010, are distributed along the Femme Osage Slough in the vicinity of the WSQ. These locations were chosen to provide the most representative data for areas potentially impacted by the quarry contamination. Location SW-1008 monitors the ponded water within the WSQ and provides a rough determination of the concentrations of the various contaminants in the WSQ pond, which may migrate to groundwater. Locations SW-1011 through SW-1013 (Figure 3-3) and SW-1015 (Howard Bend) provide baseline water quality data for the Missouri River at points both upstream and downstream from the WSQ and the Southeast Drainage (5300) easement.



SURFACE WATER SAMPLING LOCATIONS WITHIN OR NEAR THE WSCP AND WSRP AREAS OF THE WELDON SPRING SITE

FIGURE 3-1

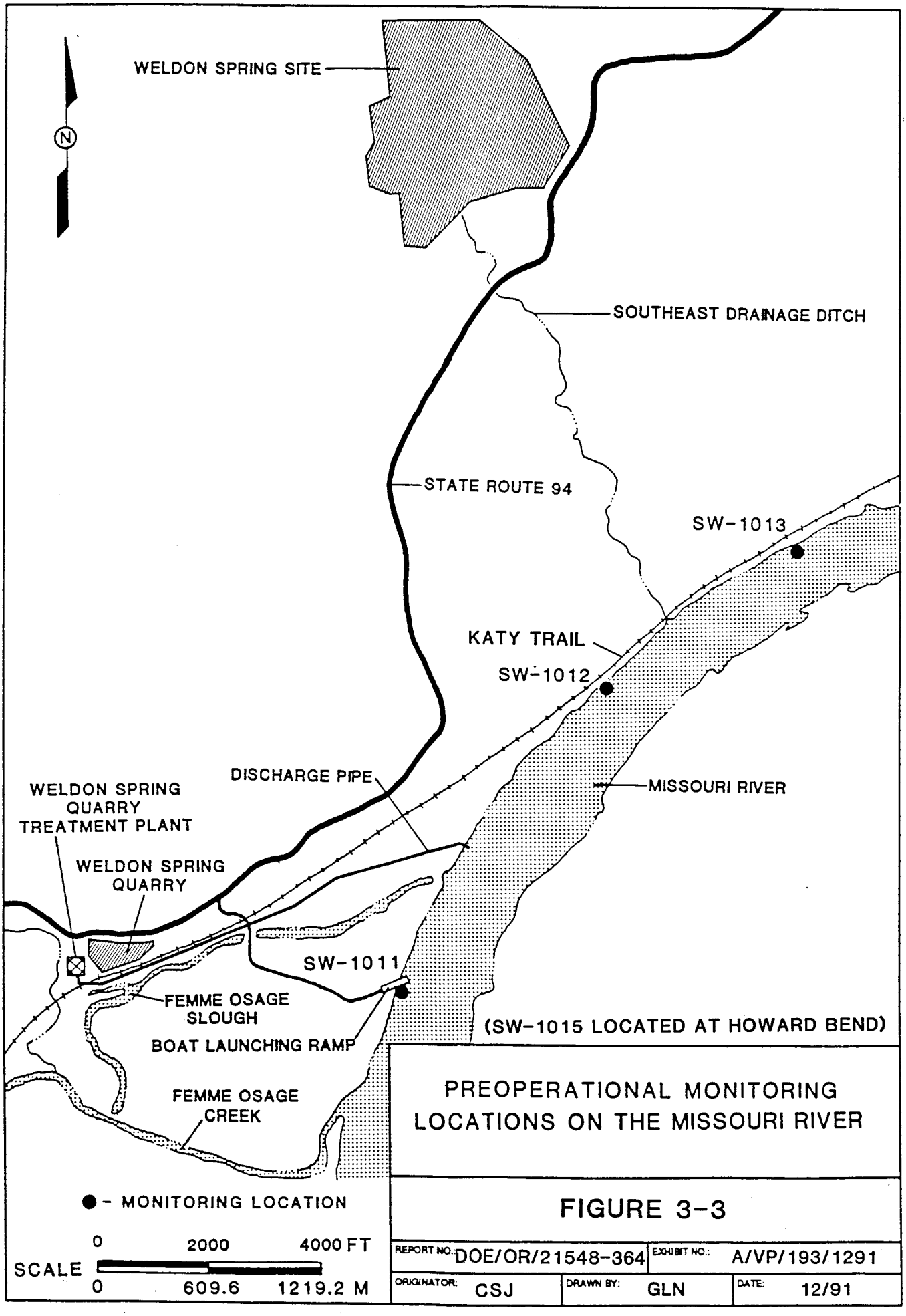
REPORT NO.: DOE/OR/21548-364	DRAWING NO.: A/VP/038/0592	
ORIGINATOR: MGT	DRAWN BY: GLN	DATE: 5/92



SURFACE WATER SAMPLING LOCATIONS NEAR THE WELDON SPRING QUARRY

FIGURE 3-2

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/QY/122/1291		
ORIGINATOR:	CSJ	DRAWN BY:	GLN	DATE:	12/91



PREOPERATIONAL MONITORING LOCATIONS ON THE MISSOURI RIVER

FIGURE 3-3

REPORT NO.	DOE/OR/21548-364	EXHIBIT NO.	A/VP/193/1291		
ORIGINATOR:	CSJ	DRAWN BY:	GLN	DATE:	12/91

TABLE 3-1 Third Quarter Radiological Results for Groundwater at the WSCP/RP/VP

Sample ID	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-228 (pCi/l)	Th-230 (pCi/l)	Th-232 (pCi/l)	Uranium (pCi/l)
SW-2001-Q392	ND	ND	ND	3.4	ND	0.8	ND	ND
SW-2002-Q392	ND	ND	ND	ND	ND	0.9	ND	23
SW-2003-Q392	ND	ND	ND	ND	ND	ND	ND	6.1
SW-2004-Q392	ND	ND	ND	ND	ND	2.1	0.8	11
SW-2005-Q392	ND	ND	ND	ND	ND	0.8	ND	21
SW-2007-Q392	ND	ND	ND	ND	ND	2.8	ND	ND
SW-2010-Q392	NA	NA	NA	NA	NA	NA	NA	NA
SW-2011-Q392	NA	NA	NA	NA	NA	NA	NA	NA
SW-2012-Q392	NA	NA	NA	NA	NA	NA	NA	NA
SW-2016-Q392	ND	ND	ND	ND	ND	1.0	ND	ND
SW-3001	NR	NR	NR	NR	NR	NR	NR	NR
SW-3002	NR	NR	NR	NR	NR	NR	NR	NR
SW-3003	NR	NR	NR	NR	NR	NR	NR	NR
SW-3004	NR	NR	NR	NR	NR	NR	NR	NR
SW-5311-Q392	109	64.4	2.0	ND	ND	0.9	ND	110

ND - Not Detected
NA - Not Available
NR - Not required during Third Quarter

3.2.1 Radiological Results

Surface water samples were collected for radiological analyses from the 13 locations shown in Figures 3-2 and 3-3. The uranium results for the fourth bimonthly period are presented in Table 3-2. Fourth bimonthly uranium concentrations for the sampling locations in the Femme Osage Slough and Little Femme Osage Creek remain within historical ranges.

3.2.2 Weldon Spring Quarry Pond Results

A summary of the analytical results for the fourth bimonthly sampling period is presented in Table 3-3. This sampling location is summarized separately to characterize the surface waters in the WSQ which may migrate and effect groundwater. The results for this bimonthly period are within historic ranges for all parameters analyzed.

TABLE 3-2 Fourth Bimonthly (July/August) Uranium Results in Surface Water at the WSQ

Sample ID	Total Uranium (pCi/l)
SW-1001-B492	ND
SW-1002-B492	ND
SW-1003-B492	44
SW-1004-B492	51
SW-1005-B492	41
SW-1007-B492	11
SW-1008-B492	NA
SW-1009-B492	7.2
SW-1010-B492	71
SW-1011-B492	2.4
SW-1012-B492	ND
SW-1013-B492	ND
SW-1014-B492	0.5

ND - Not Detected
NA - Not Available

TABLE 3-3 Fourth Bimonthly (July/August) Results for SW-1008

Parameter	Concentration	Units
Ra-226	NA	pCi/l
Ra-228	NA	pCi/l
Th-228	NA	pCi/l
Th-230	NA	pCi/l
Th-232	NA	pCi/l
Gross Alpha	NA	pCi/l
Gross Beta	NA	pCi/l
Nitrate	ND	mg/l
Sulfate	57.8	mg/l
Nitrobenzene	ND	µg/l
1,3-DNB	ND	µg/l
2,4-DNT	18	µg/l
2,6-DNT	1.1	µg/l
2,4,6-TNT	4.2	µg/l
1,3,5-TNB	0.049	µg/l

ND - Not Detected
NA - Not Available

4 EFFLUENT MONITORING

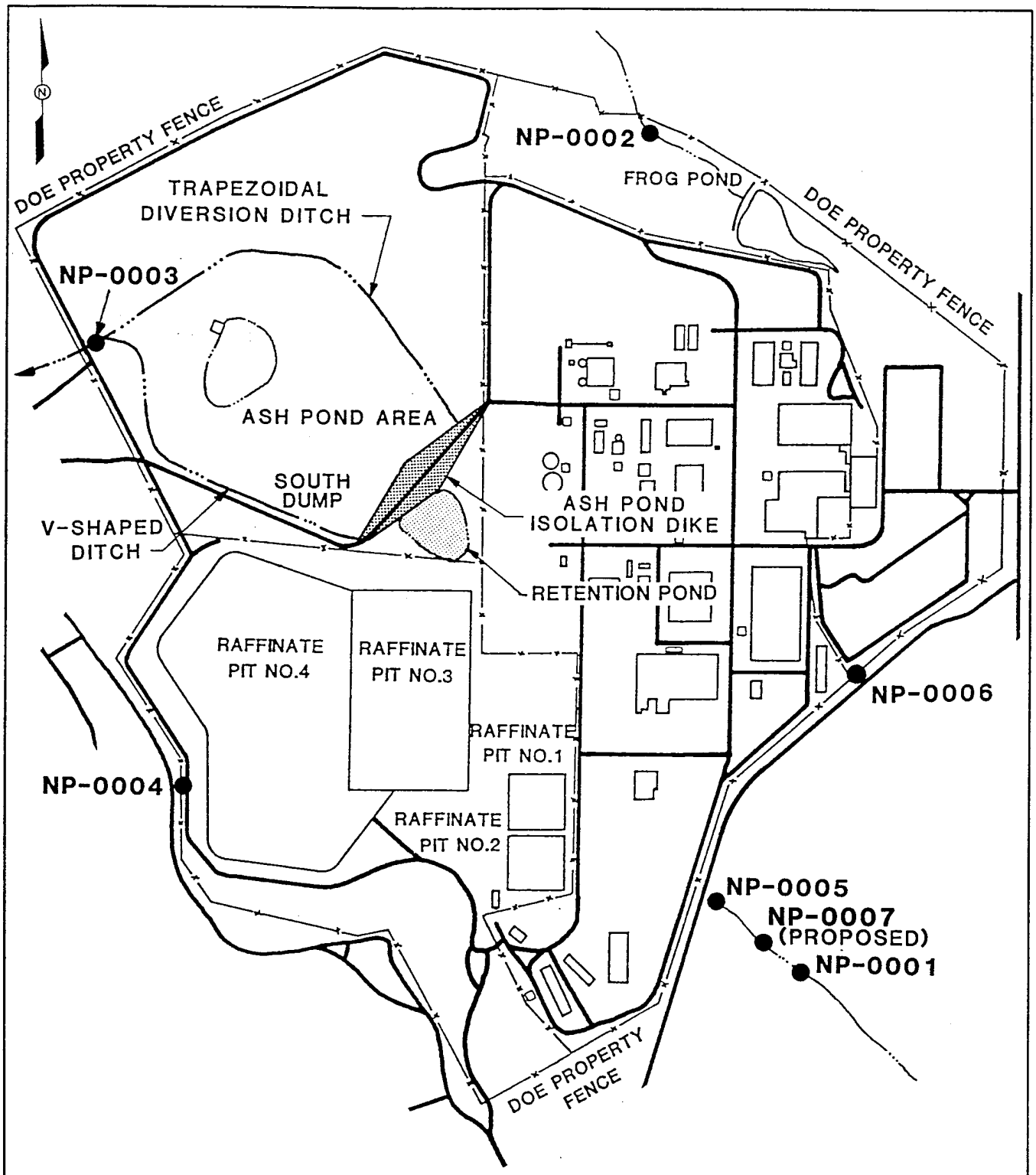
The National Pollutant Discharge Elimination System (NPDES) permit process is authorized by Section 402(a)(1) of the *Clean Water Act of 1977*. The authority to issue permits is delegated to the State of Missouri by the U.S. Environmental Protection Agency (EPA). The State of Missouri has issued four NPDES permits to the U.S. Department of Energy (DOE) allowing the discharge of storm water, hydrostatic test water, and treated wastewater to waters of the state. The permits require that samples of the wastewater be collected periodically and the results reported to the Missouri Department of Natural Resources. The following sections contain the analytical results for samples collected during July, August, and September of 1992.

4.1 National Pollutant Discharge Elimination System Data Review

Effluent samples were collected and analyzed in compliance with the Weldon Spring site NPDES permits. Permit No. MO-0107701 was issued on October 1, 1990, and currently addresses the five storm water and two wastewater discharges shown in Figure 4-1. Outfalls NP-0001 through NP-0005 represent storm water discharges; Outfall NP-0006 represents the treated wastewater discharge associated with the administration building sanitary wastewater treatment plant; and Outfall NP-0007 represents the site water treatment plant, which is under construction, but not yet completed. There was no discharge from Outfall NP-0007. Outfalls NP-0006 and NP-0007 have effluent limitations. The five storm water outfalls have "monitoring only" requirements for permitted parameters. Third quarter 1992 analytical data for each outfall are presented in Table 4-1.

Permit No. MO-0108987 was issued on May 5, 1989, for Outfall NP-1001 of the Weldon Spring Quarry water treatment plant. The plant construction is completed, but no discharge took place during the third quarter of 1992.

NPDES permit No. MO-G680001 was issued on December 19, 1991. This permit is for discharge of uncontaminated water used for new tank and basin hydrostatic testing at the quarry water treatment plant. Third quarter 1992 analytical data are presented in Table 4-2. Waters discharged from hydrostatic testing at the quarry water treatment plant were in compliance with permitted limits, with the exception of the following occurrence.



SCALE 0 500 1000 FT
0 152.4 304.8 M

NPDES SURFACE WATER SAMPLING LOCATIONS AT THE WSCP/RP

FIGURE 4-1

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/CP/050/0592		
ORIGINATOR:	TW	DRAWN BY:	GLN	DATE:	5/92

TABLE 4-1 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006

Outfall NP-0001 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	Set. Solids	Nitrate	pH	Lithium	Gross Alpha	Total Uranium	
Units	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
July 21	22,000	59.0	<0.1	0.543	7.02	ND (0.009)	404	0.669	455
August 10	22,000	21.0	<0.1	0.246	6.93	ND (0.009)	432	0.656	446

Outfall NP-0002 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	Set. Solids	Nitrate	pH	Lithium	Gross Alpha	Total Uranium	
Units	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
July 7	2,100	148	<0.1	0.26	7.38	ND (0.023)	183	0.289	197
August 10	32,700	10.0	<0.1	0.044	7.68	ND (0.009)	96.7	0.156	106
September 1	9,000	ND (2.0)	<0.1	0.12	7.61	ND (0.009)	*	0.353	240

Outfall NP-0003 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	Set. Solids	Nitrate	pH	Lithium	Gross Alpha	Total Uranium	
Units	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
July 13	28,800	3.00	<0.1	0.26	7.05	ND (0.006)	58.0	0.0946	64.3
August 27	2,900	32.0	<0.1	0.45	7.51	ND (0.010)	0.369	0.426	290
September 8	80,000	ND (5.0)	<0.1	0.27	6.85	ND (0.024)	39.0	0.0956	65.0

TABLE 4-1 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006 (Continued)

Outfall NP-0004 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	Set. Solids	Nitrate	pH	Lithium	Gross Alpha	Total Uranium	
Units	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
No Discharge	--	--	--	--	--	--	--	--	--

Outfall NP-0005 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	Set. Solids	Nitrate	pH	Lithium	Gross Alpha	Total Uranium	
Units	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
July 7	184,700	112.0	<0.1	0.81	7.43	ND (0.023)	5.67	0.00199	1.36
August 27	285,600	432.0	<0.1	0.96	7.46	0.0131	177.0	0.25	170
September 8	9,000	57.0	<0.1	0.43	6.74	0.0282	70.20	0.206	140

Outfall NP-0006 NPDES data for Q3 1992

Date Sampled	Flow	Susp. Solids	BOD	Fecal Coliform	pH
Units	GPD**	mg/l	mg/l	Colonies/100 ml	pH units
July 6	6,000	10	2	0	7.5
August 5	5,000	6	3	0	8.5
September 2	5,000	2	8	0	8.0

* Data not yet received from contract laboratory.
** Indicates flow rate at time of sample collection.
ND Not detected, detection limit is in parentheses.
-- Indicates analysis not done on this parameter.

TABLE 4-2 Results of NPDES Monitoring for Permit MO-G680001

Date Sampled	Flow	Oil and Grease*	Susp. Solids*	pH
Units	Gallons	mg/l	mg/l	
July 29	1,000	ND (5.0)	ND (5.0)	8.01
September 14	200,000	ND (5.0)	69	8.58
September 16	4,000	ND (5.0)	9	7.38
September 18	500	ND (5.0)	ND (5.0)	6.84

* Detection limit.

On September 14, 1992, storm water that accumulated in the quarry water treatment plant Effluent Pond 1 was pumped to the Little Femme Osage Creek. Water sampled from this event demonstrated a total suspended solids level of 69 mg/l, which is above the permitted limit of 50 mg/l. It is believed that a small amount of algae or sediment caused this elevated solids level.

NPDES permit No. MO-G680002 was issued on February 7, 1992. This permit is for discharge of uncontaminated water used for new tank and basin hydrostatic testing at the site water treatment plant. Third quarter 1992 analytical data are presented in Table 4-3. Waters discharged from hydrostatic testing at the site water treatment plant were in compliance with permitted limits with the exception of the following occurrence.

On August 25, 1992, a sample of water being pumped from the site water treatment plant sump into the adjacent siltation basin demonstrated a total suspended solids level of 219 mg/l, which exceeds the permitted limit of 50 mg/l. This concentration is believed to have resulted from the method used to discharge the water, and not from the tanks themselves. The method used involved discharging potable water from the tanks to a concrete floor drain and collection sumps, both of which are believed to have developed an accumulation of dust and sediment from previous building construction activities.

In the future, actions will be taken to ensure that discharged waters from hydrostatic testing meet permit limits. Hydrostatic test water will no longer be discharged to secondary containments such as floor sumps. Pretesting and/or pretreating the effluent by the mobile sump treatment system prior to discharge may be a viable option. In addition, engineering controls such as effluent filtering may be used to reduce suspended solids discharge.

TABLE 4-3 Results of NPDES Monitoring for Permit MO-680002

Date Sampled	Flow	Oil and Grease*	Susp. Solids*	pH
Units	Gallons	mg/l	mg/l	
August 25	1,500	(a)	219	7.08
August 26	1,750	ND (5.0)	13	7.02
September 3	200,000	ND (5.0)	19	9.4

* Detection limit.
(a) Sample bottle was broken during shipment. No analysis was performed.

4.1.1 Radiological Analysis

Gross alpha and uranium analyses corresponded well with past data. The storm water outfalls had the following ranges of uranium concentrations. The process sewer outfall NP-0001, had two sample values of 455 pCi/l (0.669 mg/l) and 446 pCi/l (0.656 mg/l). Frog Pond outfall, NP-0002, had values from 106 pCi/l (0.156 mg/l) to 240 pCi/l (0.353 mg/l). The Ash Pond outfall, NP-0003, had values from 64.3 pCi/l (0.0946 mg/l) to 290 pCi/l (0.426 mg/l). There was no discharge from NP-0004 during the periods specified for monitoring in the permit, in the third quarter. The Southeast Drainage outfall, NP-0005, had values from 1.36 pCi/l (0.00199 mg/l) to 170 pCi/l (0.25 mg/l). These values were all below the derived concentration guideline (DCG) of 600 pCi/l.

4.1.2 Other Analysis

Other analyses for NP-0001 through NP-0005 include physical analyses (settleable solids and total suspended solids) and chemical analyses (nitrate, pH, and lithium). Third quarter 1992 values correspond well with past values for all parameters, and are displayed in Table 4-1.

The permit for the discharge from the administration building treatment plant at outfall NP-0006 has effluent limitations and a requirement to monitor once per quarter. Flow must be measured once a month. The Subcontractor monitors the effluent once a month to assess plant performance, thus generating two additional sample analyses a quarter. The NPDES permit specifies effluent limitations for biochemical oxygen demand (BOD), total suspended solids

(TSS), pH, and fecal coliform at this outfall. The limits for BOD are 10 mg/l monthly average and 15 mg/l weekly average; for TSS, 15 mg/l monthly average and 20 mg/l weekly average; for fecal coliform, 400 colonies per 100 ml monthly average and 1,000 colonies per 100 ml daily maximum. The Subcontractor is continuing to make operational changes to improve plant performance. Effluent from the administration building treatment plant was well within these limits during the third quarter 1992. In addition, a flow equalization system is being added to the treatment plant and should become operational during the fourth quarter of 1992. The equalization of flow should greatly improve the operation of the plant.

5 AIR MONITORING

5.1 Radon Gas

The radon gas monitoring program utilizes a pair of alpha track radon detectors at each of the 25 permanent locations; each detector is exchanged quarterly. These detectors are deployed at six locations at the Weldon Spring Chemical Plant, eight locations at the Weldon Spring Quarry, four locations at the Weldon Spring raffinate pits, and at seven off-site locations. Radon monitoring locations are shown in Figures 5-1, 5-2, and 5-3. On-site detectors are distributed around the perimeter fences to ensure adequate detection of radon dispersing from the properties under various atmospheric conditions. Locations RD-4001, RD-4004, RD-4005, RD-4006, and RD-4007 monitor background levels near the site.

Landauer Type F track etch detectors were used for radon monitoring during the third quarter of 1992. The Type F detector is designed especially for outdoor monitoring of airborne radon concentrations. The detection mechanism consists of counting tracks generated by alpha particles in detector media to determine the radon concentration.

Table 5-1 summarizes the third quarter 1992 radon concentrations detected at all site perimeter and off-site monitoring locations. These concentrations represent the average of the two radon detectors placed at each location. Also contained in the third column of Table 5-1 is a comparison of the measured concentration with the Federally permitted radon concentration (for unrestricted areas) of 3 pCi/l (111 Bq/m^3)[1] above background as authorized by DOE Order 5400.5.

An average ambient background concentration was determined by calculating the arithmetic average for the five background locations. These data yielded an average ambient background radon concentration of 0.24 pCi/l (8.88 Bq/m^3) for the third quarter of 1992. This concentration was then subtracted from the concentration for each monitoring station, and compared to the U.S. Department of Energy (DOE) guideline of 3 pCi/l (111 Bq/m^3) above background.

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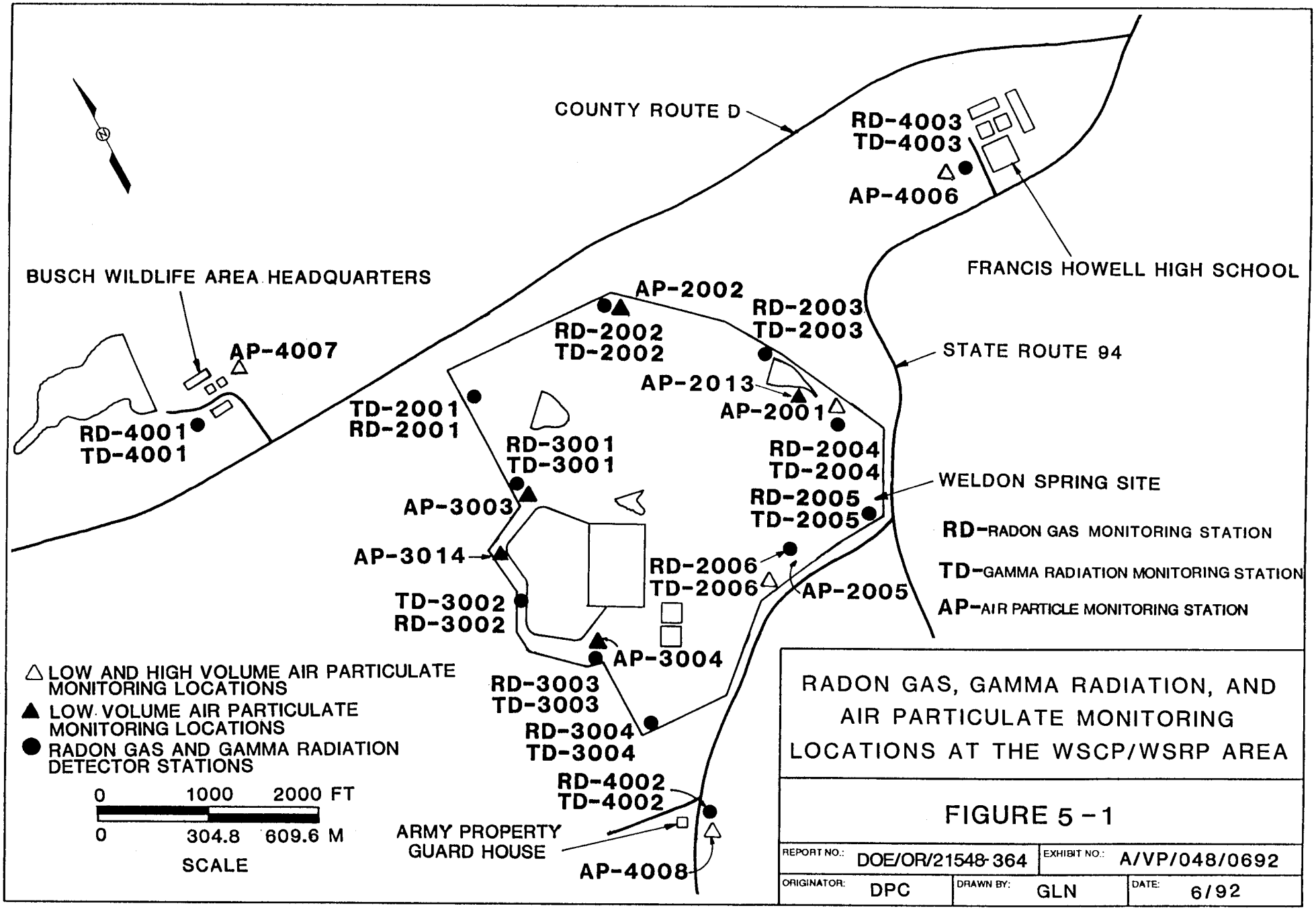
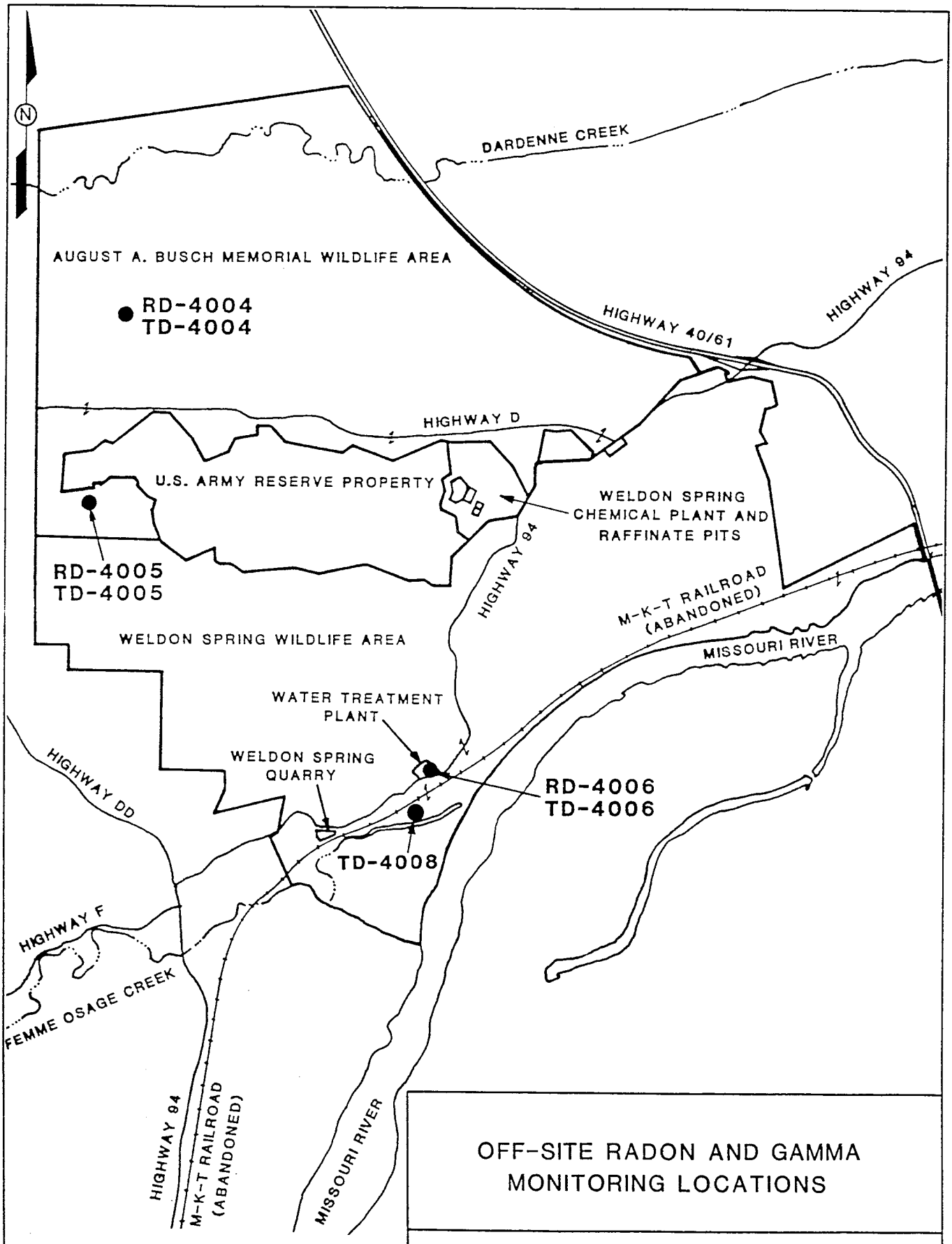
1 To convert μCi/ml to Bq/m^3, multiply by 3.7E10.



RADON GAS, GAMMA RADIATION, AND AIR PARTICULATE MONITORING LOCATIONS AT THE WSCP/WSRP AREA

FIGURE 5-1

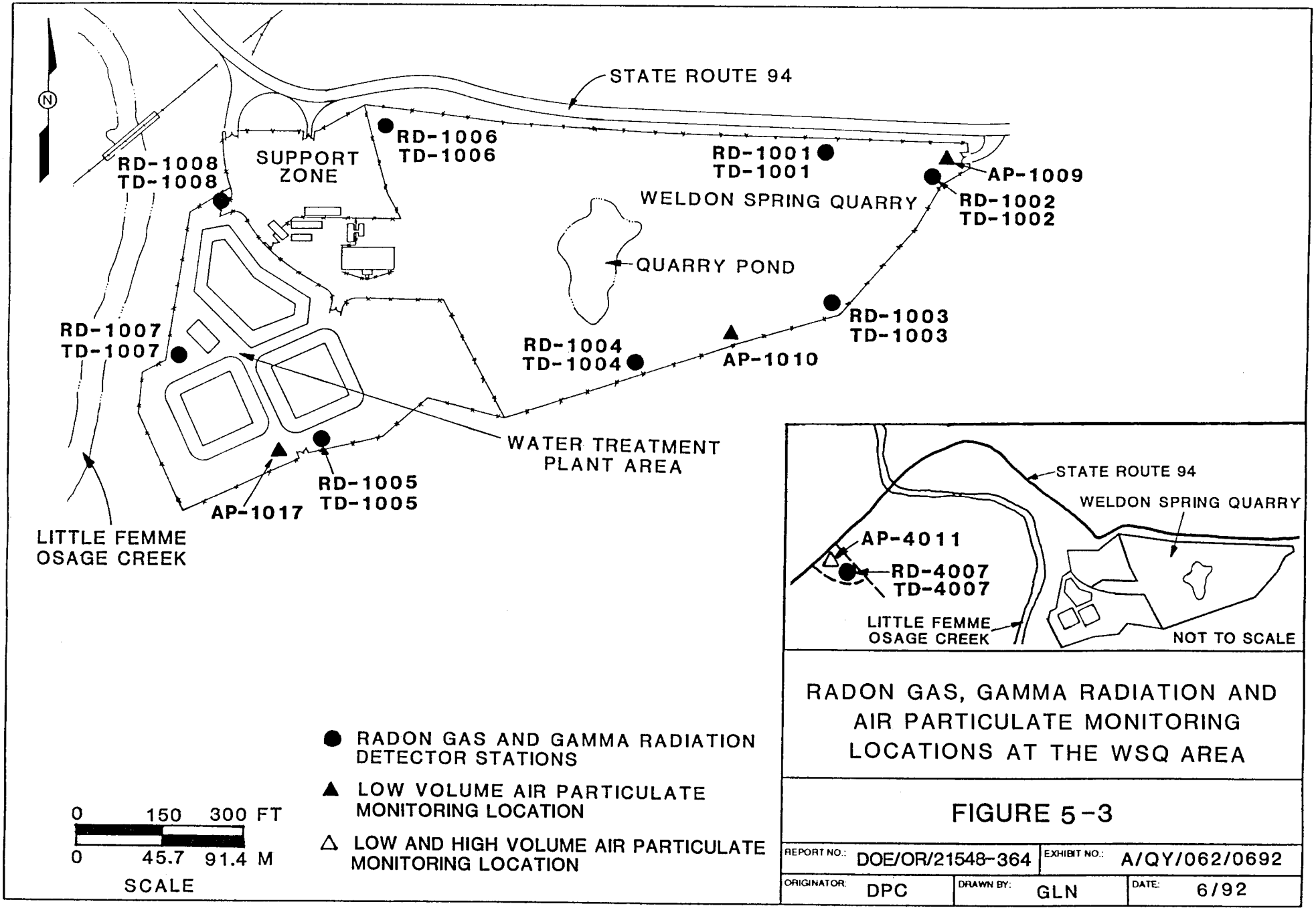
REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/VP/048/0692		
ORIGINATOR:	DPC	DRAWN BY:	GLN	DATE:	6/92



OFF-SITE RADON AND GAMMA MONITORING LOCATIONS

FIGURE 5-2

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/VP/042/0592		
ORIGINATOR:	DPC	DRAWN BY:	GLN	DATE:	5/92



RADON GAS, GAMMA RADIATION AND AIR PARTICULATE MONITORING LOCATIONS AT THE WSQ AREA

FIGURE 5-3

REPORT NO.:	DOE/OR/21548-364	EXHIBIT NO.:	A/QY/062/0692		
ORIGINATOR:	DPC	DRAWN BY:	GLN	DATE:	6/92

TABLE 5-1 Third Quarter 1992 Track Etch Radon Monitoring Results[a]

Location ID	3rd Quarter pCi/l	Percent of Guideline [b]
WSQ		
RD-1001	1.7	50
RD-1002	1.6	47
RD-1003	0.7	17
RD-1004	0.3	3
RD-1005	0.3	3
RD-1006	0.3	3
RD-1007	0.2	0
RD-1008	0.2	0
WSCP		
RD-2001	0.3	3
RD-2002	0.4	7
RD-2003	0.1	0
RD-2004	0.2	0
RD-2005	0.2	0
RD-2006	0.3	3
WSRP		
RD-3001	0.4	7
RD-3002	0.4	7
RD-3003	0.2	0
RD-3004	0.3	3

TABLE 5-1 Third Quarter 1992 Track Etch Radon Monitoring Results[a] (Continued)

Location ID	3rd Quarter pCi/l	Percent of Guideline [b]
OFF-SITE		
RD-4001*	0.2	NA
RD-4002	0.1	0
RD-4003	0.3	3
RD-4004*	0.3	NA
RD-4005*	0.2	NA
RD-4006*	0.3	NA
RD-4007*	0.2	NA

(a) Results include natural background.

(b) Percent of guideline calculated by taking the quarterly average minus the average of the background stations divided by the DOE concentration guideline for Rn-222 which is 3 pCi/l (111 Bq/m^3)(Annual average above background) for uncontrolled areas.

* Denotes Background Station; therefore, percent of guideline not applicable (NA).

Radon concentrations at the site and quarry perimeters and at off-site locations for the third quarter of 1992 were within the typical range expected during periods of normal precipitation. The quarterly radon concentrations at the Weldon Spring Chemical Plant/raffinatepit (WSCP/RP) area averaged 0.3 pCi/l (11.1 Bq/m^3), while the quarterly radon concentrations at the Weldon Spring Quarry (WSQ) averaged 0.7 pCi/l (25.9 Bq/m^3). The quarterly radon
concentrations from each individual detector (background included) ranged from less than the detection limit of 0.07 pCi/l (1.11 Bq/m^3) to 1.8 pCi/l (66.6 Bq/m^3).

Radon concentrations found at the quarry are higher than concentrations measured at other locations, because the radium concentrations in quarry wastes are typically higher than in other areas. Also, the quarry is a large depression with side walls ranging from 3 m to 15 m (10 ft to 50 ft) high, which tends to trap emanating radon within the quarry and raise the concentrations along the quarry perimeter.

5.2 Gamma Radiation Exposure

To monitor exposure from gamma radiation, environmental thermoluminescent dosimeters (TLDs) were deployed at 26 locations. The gamma monitoring locations are identified in Figures 5-1, 5-2, and 5-3 with a prefix TD-.

Table 5-2 summarizes the third quarter results of total gamma radiation monitoring at the 18 Weldon Spring site perimeter monitoring stations, Francis Howell High School (FHHS), the Weldon Spring Army Reserve Training Area, and at the six background monitoring stations.

The Weldon Spring Site Remedial Action Project changed TLD vendors starting with the third quarter of 1992. During the second quarter of 1992, duplicate TLDs, one from the old vendor and one from the new vendor, were deployed at four monitoring locations. The results from the new vendor TLDs appeared to be consistent with historical data.

The results from the third quarter of 1992 (average of 12.0 mrem) appear to be lower than would be expected when compared to the third quarter of 1991 (average 16.0 mrem). The lower than expected results for the third quarter of 1992 may be related to the results of the control TLD, which was subtracted from the results of TLDs deployed at the monitoring locations. The control TLD is used to exclude any exposures recieved by the monitoring location TLDs during transit to and from the vendor, and during storage prior to and after deployment. The lower than expected third quarter results will continue to be investigated and the outcome will be reported in the annual site environmental report.

5.3 Radioactive Air Particulates

Fourteen low volume air particulate samplers continuously monitor the Weldon Spring site. Five of these (AP–2001, AP-2002, AP-3003, AP-3004, and AP-2005) are located around the Weldon Spring Chemical Plant (WSCP) perimeter and two are located around the quarry perimeter. There are five critical receptor monitoring stations, AP-4006, AP-4008, AP-2001, AP-2005 and AP-4011, located off-site at the Francis Howell high School, the Army Reserve property, the highway maintenance facility, the Weldon Spring Site Remedial Action Project (WSSRAP) administration building, and near a residential site west of the quarry, respectively. Three new monitoring stations were recently added during the second quarter of 1992. Two of the new monitoring stations, AP-2013 and AP-3014, were installed at the WSCP perimeter. The

TABLE 5-2 Third Quarter 1992 Environmental TLD Monitoring Results[a]

Location ID	3rd Quarter mrem
WSQ	
TD-1001	14.1
TD-1002	16.3
TD-1003	12.9
TD-1004	14.4
TD-1005	--
TD-1006	12.3
TD-1007	14.3
TD-1008	13.4
WSCP	
TD-2001	11.9
TD-2002	12.4
TD-2003	11.8
TD-2004	15.5
TD-2005	--
TD-2006	12.1
WSRP	
TD-3001	13.1
TD-3002	--
TD-3003	12.2
TD-3004	10.1
OFF-SITE	
TD-4001*	--
TD-4002	6.5
TD-4003	6.2
TD-4004*	13.3

TABLE 5-2 Third Quarter 1992 Environmental TLD Monitoring Results[a] (Continued)

Location ID	3rd Quarter mrem
TD-4005*	9.6
TD-4006*	10.8
TD-4007*	9.6
TD-4008*	--

(a) Results include natural background.
- Denotes lost or damaged TLD.
* Denotes background station.

other new station, AP-1017, was installed at the WSQ perimeter. The monitoring station at the August A. Busch Wildlife Area (AP-4007) is used to monitor background levels in the vicinity of the WSCP. The air particulate monitoring station locations are shown in Figures 5-1 and 5-3.

The background sampling station AP-4007, is approximately 0.8 km (0.5 mile) from the WSCP perimeter in a northwestern direction. The terrain between the WSCP and this sampling station is hilly and forested, providing a significant physical barrier to airborne particulates originating from the WSCP/WSRP area.

Table 5-3 summarizes the quarterly average concentrations and the standard deviations for the 14 air monitoring locations. The quarterly average concentration for each monitoring location was calculated by averaging all weekly air particulate analysis results including results lower than the instruments lower limit of detection (LLD). The corresponding standard deviation for each monitoring location was also calculated using all weekly air particulate analysis results. Due to maintenance and installation of new samplers, all samplers were not operating the entire 13 weeks, as indicated in the fourth column of Table 5-3. The WSSRAP has deployed high volume air samplers, as well as low volume air samplers, at critical receptor locations. These high volume samplers are used in accordance with the *Plan for Monitoring Radionuclide Emissions Other Than Radon at the Weldon Spring Site Critical Receptors* (MKF and JEG 1992b). The high volume monitoring results will be presented in the 1992 annual site environmental report.

TABLE 5-3 Third Quarter 1992 Radiological Air Particulate Monitoring Results

Monitor Identification Number	Quarterly Avgerage Gross Alpha Concentration (μCi/ml)	Standard Deviation (μCi/ml)	Number of Weeks Collected	Number of Values Above LLD
AP-2001	1.28E-15	5.46E-16	13	11
AP-2002	1.26E-15	4.94E-16	13	12
AP-3003	1.15E-15	5.28E-16	12	12
AP-3004	1.31E-15	6.72E-16	13	12
AP-2005	1.27E-15	4.91E-16	12	12
AP-4006	1.08E-15	3.23E-16	13	13
AP-4007	1.28E-15	4.93E-16	13	13
AP-4008	1.02E-15	3.38E-16	13	13
AP-1009	1.52E-15	6.91E-16	13	11
AP-1010	1.47E-15	7.33E-16	13	12
AP-4011	1.31E-15	5.15E-16	13	12
AP-2013	1.02E-15	3.41E-16	13	13
AP-3014	1.24E-15	6.91E-16	13	12
AP-1017	1.01E-15	5.34E-16	12	9

* Indicates background monitor station.

The third quarter average long-lived gross alpha concentrations ranged from 1.01×10^{-15} μCi/ml to 1.52×10^{-15} μCi/ml for perimeter and off site locations. The average background concentration measured at AP-4007 was 1.28×10^{-15} μCi/ml.

5.4 Asbestos

In accordance with the *Environmental Monitoring Plan* (MKF and JEG 1992a) the WSSRAP collected environmental airborne asbestos samples. These samples were collected at both the FHHS and the WSSRAP perimeter during bulk asbestos removal operations.

The samples collected at the perimeter locations all showed results of 0.003 fibers/cc or less. Fourteen samples were collected at the perimeter of which nine had measured concentrations below the detection limit.

The samples collected at the FHHS all showed results of 0.004 fibers/cc or less. Thirty-two samples were collected at the FHHS of which 10 were less than the detection limit.

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